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GB 1446793
GB 1330419
GB 398224
GB 344246
GB 316317
GB 311981
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# (54) Leaf spring railway bogies

(57) An H-frame bogie comprises a leaf spring assembly 15 connected between wheel axles of the bogie. The leaf springs 15 have a non-linear spring characteristic resulting from identical cross-section and length of each leaf 17. The arrangement causes the wheel axles to radiate as the bogie negotiates a curve, thereby contributing to reduced wear and reduced possibility of derailment. The leaf spring 15 acts as a load equalizing beam. The connection between the bogie and the vehicle body is by a centre bearing assembly 6 which transfers horizontal forces and side bearing assemblies, each including a gear rack engaging with vehicle body rollers 10, which transfer vertical forces.

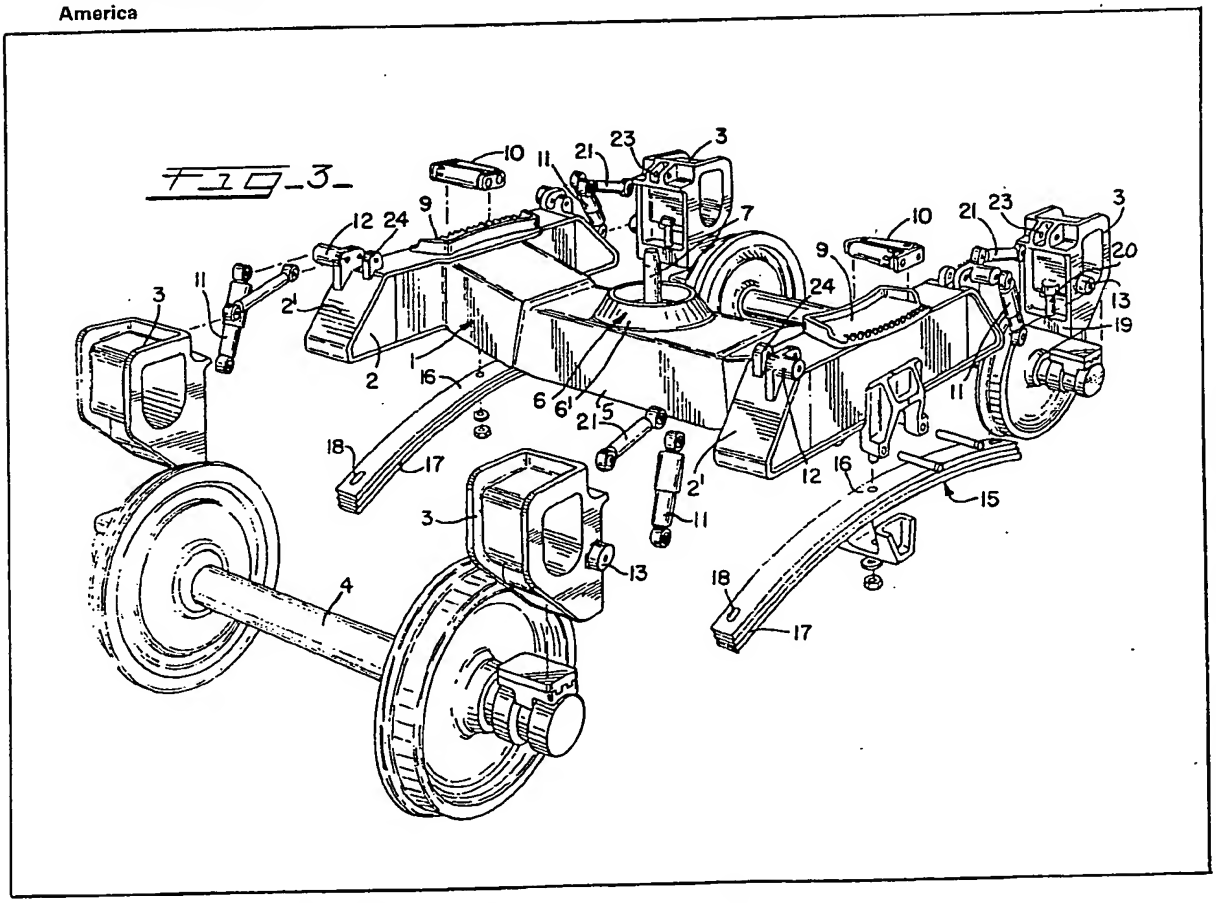


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Fig. 1

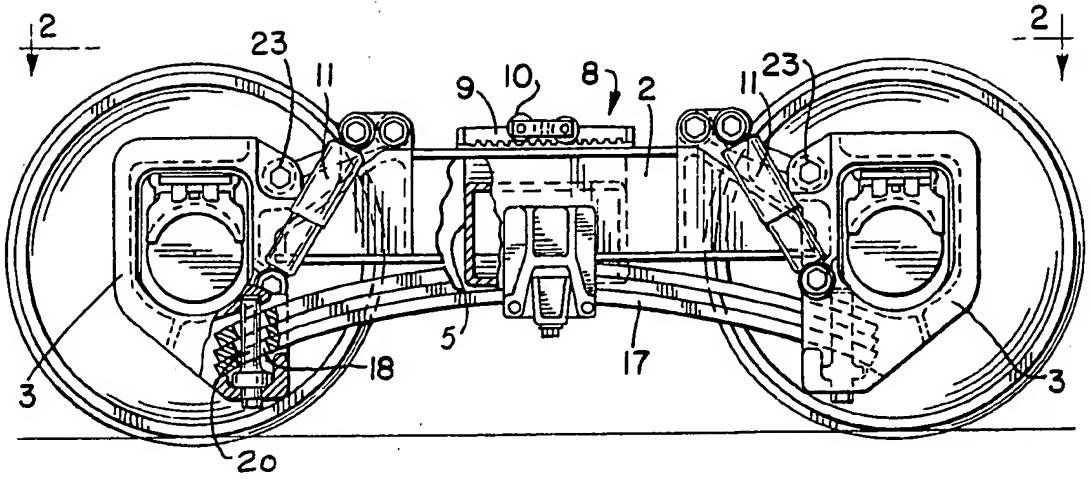
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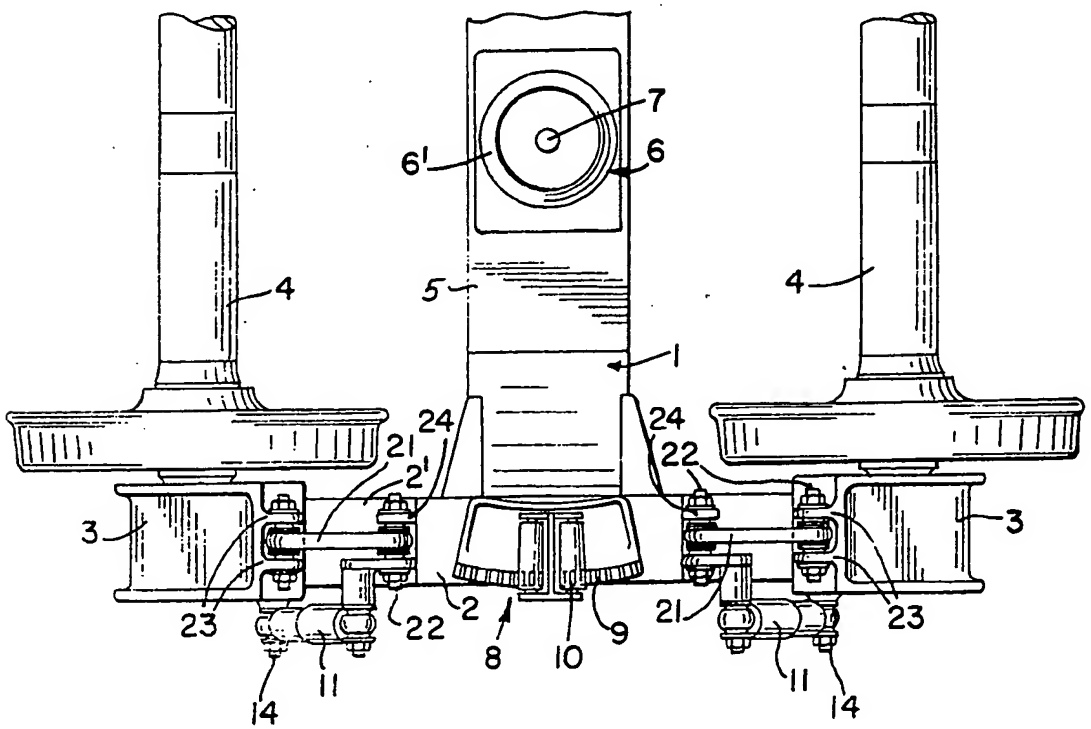
Fig. 2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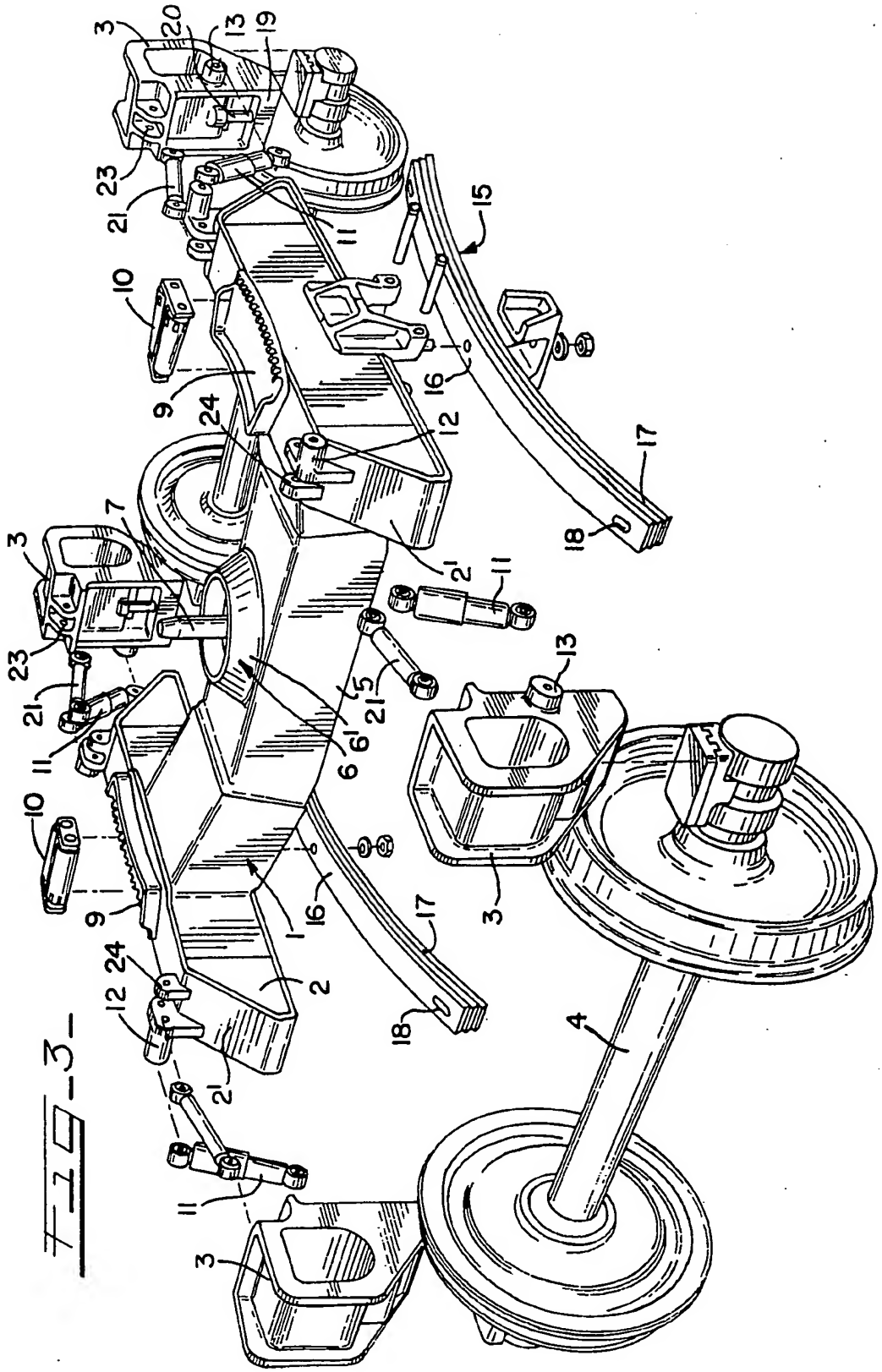


FIG_3_

SPECIFICATION
**Leaf spring truck**

BACKGROUND OF THE INVENTION
Field of the invention

The subject of the invention relates to railway cars and particularly to the trucks thereof.

Description of the prior art

Prior art is exemplified by the below described patents.

One of the patents discloses railway trucks having a transom under a bolster between side frames and resting upon spring assemblies mounted in openings in the side frames with the car body bearing assemblies absorbing the car body weight mounted on the bolster above the spring assemblies.

Another patent discloses a truck with rocker arms longitudinally interconnected by a loosely suspended wire cable and transversely interconnected by spring rods, and having leaf springs connected to the rocker arms by pendulum rods.

One of the embodiments of the prior art includes a truck having pivotal connection of transversely swingable side links to a bolster and a journal box for permitting relative movement between the link ends and the bolster in two directions.

Another patent has shown a vehicle bogie having each wheel axle linked to a bolster by pivoted radius arms, permitting vertical and lateral swinging of each arm, and having leaf springs operatively connected to the bolster and radius arms by a unit comprising a wire cable and abutments.

A construction which includes a wheel axle frame privotally connected by the ball-joints to a carrier beam resting on the springs which are suspended from the frame was also shown in one of the patents.

The above described prior art does not reflect the unique concept of the subject invention.

We have identified a requirement for a railway truck having improved riding characteristics leading to reduction of hunting, rock and roll and improving rough track negotiability.

We have also identified a requirement for a load equalizing member distributing vertical load between wheel axles of a truck. For this purpose we provide a leaf spring assembly serving as a beam equalizing the load on wheels regardless of suspension travel.

In accordance with the subject invention a railway "H"-frame car truck includes a bolster with attached side frames, journalling means rigidly connected to wheel axles, links and vertical shock absorbers pivotally interconnecting the journalling means and side frames, and leaf spring assemblies. The truck will be substantially lightened due to the transfer of vertical car load at the side bearings instead of the center bowl. The center bowl is replaced by a center bearing assembly about which the truck will swivel. Pivotal links allow fluctuation of spacing between the wheel axles as the truck negotiates a curve. The leaf springs being of identical length and shape eliminate need for complicated and heavy leaf springs, because the load on the axle is shared between the spring and contact between the spring and side frame. The leaf springs display non-linear spring characteristics resulting from a constant cross-section of the length of the springs. The shock absorbers complement the leaf spring assemblies by absorbing a part of energy impacts.

The nature, principle and utility of this invention will become more apparent from the following description and the appended claims when read in conjunction with the accompanying drawings, in which like parts are designated by like reference numerals.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of a truck designed in accordance with the present invention with broken away portions;

FIG. 2 is a top view of a truck;

FIG. 3 is an exploded perspective view of the truck.

DESCRIPTION OF THE PREFERRED EMBODIMENT

As shown in FIGS. 1, 2 and 3, a rigid "H"-frame truck comprises a bolster 1 with integral side frames 2 of trapezohedral shape including slanted portion 2'. Journal boxes 3 are attached to the wheel axles 4. The center portion 5 of the bolster 1 is lower than its ends. A center bearing assembly 6 including a trunnion 6' and a center pin 7 transferring the horizontal forces applied to the car body to the truck is provided on top of the center portion 5. A side bearing assembly 8 located on each side frame adjacent to each end of the bolster 1 transfers vertical forces of the car body to the truck comprising an arcuate gear rack 9, which allows the rotation of the car body about the truck as car body rollers 10 engage with the gear rack 9. The side bearing assemblies 8 are disposed substantially medially between the ends of each side frame 2. Inclined vertical shock absorbers 11 disposed outboardly of the truck are attached to side frame brackets 12 and journal box side mounts 13 by bolt pins 14. The vertical shock absorbers 11 pivotally interconnecting each journal box 3 and the side frames 2 serve for absorbing vertical forces in combination with a leaf spring assembly 15 pinned to journal boxes 3 and disposed in abutment with the underside of each side frame 2 in its uppermost portion 16. A bolt 16', connecting the leafs springs, has its head portion disposed within the side frame 2. Each leaf 17 of the leaf spring assembly 15 is of identical shape and length and has an opening 18 at the ends thereof in registry with each other. A lower saddle bracket 19 of each journal box has an upwardly extending guiding pin 20 projecting through the leaf springs openings 18.

Pivotal links 21 connected to end pins 22, which are supported by the journal box projecting lugs 23 and the side frame projecting lug 24 and

bracket 12, are tucked into the space above the slanted portion 2' of each side frame 2, thereby contributing to the truck's space and weight economy. The links 21 pivotally interconnecting journal boxes 3 and side frames 2 facilitate the fluctuation of the axle spacing caused by natural load transfer as the truck is cornering.

This truck design offers an advantage of using a leaf spring assembly having each leaf of equal shape and length. The unloaded leaf spring is supported at the center of the side frame underside. As load increases, the leaf spring deflects and bears along the underside of the side frame moving closer to the axle. That is, the effective length of the spring decreases as the load on the suspension increases. Having the leafs of identical shape and size contrasts to a normal leaf spring assembly seen on automotive or railway applications where leafs of different shape and size are required. This design concept permits the stress levels to be kept low in the spring thereby diminishing the possibility of spring failure and eliminates the need for complicated and heavy leaf springs disclosed in the prior art, because the load on the axle is shared between the spring and contact between the spring and side frame. Also a leaf spring assembly functions as a load equalizing beam equalizing load on wheel axles regardless of suspension travel.

Another very beneficial feature of this design is its "steering" capability which enables the truck to negotiate curves without heavy contact and wear between wheel flanges and the rail. The natural weight transfer from inside the outside wheels causes the axle spacing on the heavily loaded side to increase. As the car goes around the curve, the load increases on the wheels on the outside rail. Because of the links pivotally interconnecting the side frames and journal boxes on the axles, the spacing between the axle centers also increases on the heavily loaded side. This results in the axles assuming a radial position and "sterring" through the curve. The truck bolster is substantially lightened due to the transfer of vertical car load at the side bearings instead of the center bowl. The center bowl is replaced by a center bearing assembly transmitting only horizontal forces. The trapezohedral shape of side frames, disposition of the pivotal links above the side frame slanted portions, the lowered center portion of the bolster accomodating the center bearing assembly, the outboard location of the shock absorbers and a new design of a lightweight leaf spring assembly functioning as a load equalizing beam make this rigid "H"-frame truck more compact, inexpensive and soft to ride upon than other conventional trucks.

Utilization of the "H"-frame allows to have a stabilized train of a truck, i.e. wheel axles are parallel and straight, in contradistinction with a 3-piece frame, whereon a bolster and side frames are not rigidly connected. A 3-piece arrangement permits positioning of one side frame ahead of another with bolster being angled as to them, thereby contributing to hunting instability of a truck.

Since many changes and modifications can be made to the specific embodiment of the invention described hereinbefore without departing from the spirit of the invention, it is intended that such description shall be interpreted as illustrative of the invention and not in a limiting sense.

CLAIMS

1. A railway car truck comprising, in combination,

a bolster having an integral side frame attached to each end thereof,

wheel axle journal means,

a vertically compressible leaf spring assembly attached to each of said side frames and respective journal means,

link means and shock absorbing means pivotally interconnecting said side frames and journal means,

car body side bearing assemblies mounted on said side frames and for absorbing vertical forces of an associated car body adapted to be mounted on the truck, and

a bolster center bearing assembly mounted on the bolster adapted to transfer horizontal forces from said associated car body to said truck.

2. A railway car truck in accordance with Claim 1,

a center portion of said bolster being lower than the ends thereof.

3. A railway car truck in accordance with Claim 1,

each said side bearing assembly including an arcuately shaped gear rack mounted on the respective side frame for cooperative associated car body side bearing roller assemblies.

4. A railway car truck in accordance with Claim 1,

said side frames being of trapezohedral shape including slated portions at the ends thereof,

having said link and shock absorbing means attached thereto.

5. A railway car truck in accordance with Claim 1,

said side frames being of trapezohedral shape including slanted portions at the ends thereof,

said vertical shock absorbing means being pivotally attached to said side frames in the area of said slanted portion, and

said shock absorbing means being attached to said journal means and extended outwardly therefrom.

6. A railway car truck in accordance with Claim 1, and

said spring means comprising upwardly bowed leaf springs abutting at its crest of curvature against the respective side frame at the juncture thereof with the bolster portion and said spring means having opposite ends operatively connected to the journal means on the respective side of the truck.

7. A railway car truck in accordance with Claim 1, and

said leaf spring assembly having leafs of equal

length.

8. A railway car truck in accordance with Claim 1,

said side frames being of trapezohedral shape including slanted portions at the ends thereof, and

said link means being disposed in the area of said slanted portions.

9. A railway car truck in accordance with Claim 1,

said journal means having a lower saddle portion, a guiding pin being attached to said saddle portion,

the ends of said leaf spring assemblies including a plurality of leaf springs each having an opening in registry with each other, and

said guiding pin being projected through said end opening.

10. A railway car truck in accordance with Claim 1, said bolster center bearing assembly comprising a trunnion and a center pin about which the truck swivels and engageable with the car body in conventional manner.

11. A railway car truck having a pair of spaced wheel and axle assemblies having journal means at each end thereof,

axle load equalizing means comprising leaf spring means at each side of the truck extending between the journal means at said side and supported thereby at a level below said axles,

a unitized bolster-side frame assembly having a transverse bolster portion and side frame portions at the ends of the bolster positioned at opposite sides and supported on said spring means,

said frame portions having ends extending into respective journal means at that side of the truck, and

means for controlling motions between the journal means and respective side frames.

12. A railway car truck in accordance with Claim 11,

said motion limiting means comprising links pivoted at opposite ends to the respective side frame ends and journal means on predetermined axes, and

shock absorber means pivoted at one end to the related side frame on an axis parallel with and spaced from the axis of the associated link means, said shock absorber means being pivoted on an axis below and parallel with the axis of pivot of associated link.

13. A railway car truck in accordance with Claim 11, and

said leaf springs having a constant cross-section lengthwise.

14. A railway car truck substantially as hereinbefore described, having reference to the accompanying drawings.

15. A railway car truck wherein a vertically compressible leaf spring assembly is connected between wheel axles of the truck and permits fluctuation of the wheel axle spacing as the truck negotiates curves.

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